FDM 15-1-1 General *September 19, 2014*

1.1 Originator

The Director, Bureau of Project Development is the Originator of this chapter. All questions and comments concerning this chapter should be directed to the following individuals:

- Section 1 (Standards) and 10 (Review) - Proposal Services Section, 601 Hill Farms, 608-267-7774.
- Section 5 (Methods) - Methods Development Specialist, Bureau of Project Development, 651 Hill Farms, (715) 836-2894.

1.2 Objective

Preparation of contract plans involves preparing a set of detailed drawings showing location and geometric configuration, quantities and details of work to be performed on a particular project. The objective of this chapter is to present standards that will meet the requirements of the Wisconsin Department of Transportation, the Federal Highway Administration and the contractor.

1.3 Composition

The number and type of sheets is dependent on the type and scope of work. As a minimum, the following shall be included:

- Title Sheet
- Typical Section and/or Detail Sheet
- Estimate of Quantities Sheet
- Miscellaneous Quantities Sheet
- Plan Sheet

Other sheets that may be included are:

- Right-of-Way Plat,
- Plan and Profile Sheet
- Standard Detail Drawings
- Sign Plates
- Structure Plans
- Computer Earthwork Data
- Cross Sections

Sheets may be combined when space permits (e.g., Typical Section and Details).

1.4 Multiple Contract or Multiple Project Plans

When there are multiple contracts under one Federal Project Number, all contracts should be included within one plan.

When multiple project I.D.'s are included under one contract, the projects may be prepared in separate plan sets for each project or all projects included under one plan (max.9 projects per plan set.)

1.5 Numbering of Plans

The numbering system for plans begins with page 1 for the title sheet and increases sequentially through the last page of the plan. This shall only be completed by the CO Project Examiner when the contract is ready for LET. The title sheet is not numbered.

A system of sections is used to subdivide the contract plan into various subject areas. Contract plan subject areas and associated sections are listed below. The sections are identified by numbered tabs in the left and right margins of the plan sheet as shown in FDM 15-5-5. All plan sheets (except the Title Sheet and Estimate of Quantities) shall have these section tabs.

Subject Area	Section
Title Sheet	1
Typical Sections and Details	2
Estimate of Quantities	3
Miscellaneous Quantities	3
Right-of-Way Plat	4
Plan and/or Profile	5
Standard Detail Drawings	6
Sign Plates	7
Structure Plans	8
Computer Earthwork Data	9
Cross Sections	9

When more than one subject area is combined on one sheet, the lowest number in the section numbering sequence is used.

The region should arrange the sheets in proper order but central office plan examiners will perform final sheet numbering after all sheets are inserted.

1.6 Typical Section and Detail Sheets

When there are 15 or more typical section and detail sheets (Section 2 sheets) a note showing the order of the sheets should be included in the plan. The note should appear on the first sheet of section 2. Following is the preferred order of Section 2 sheets:

- Written Material
- Project Overview
- Typical Sections
- Construction Details
- Intersections
- Interchanges
- Contour Maps
- Cross Section Matchline
- Erosion Control and Drainage
- Storm Sewer and Utilities
- Planting
- Signing
- Lighting
- Traffic Signals
- Pavement Marking
- Traffic Control and Construction Staging
- Fencing
- Alignment

Some of the above sheets may be combined on one sheet as presented in FDM 15-1-20. If combined, the detail highest on the preferred order list shall govern its placement.

FDM 15-1-4 Preliminary Plan

June 19, 2013

4.1 General

A preliminary plan is a graphical representation on the Design Study Report (DSR). It differs from the final plan in purpose since it is intended for designers and reviewers to reach agreement in project concepts whereas the final plan will provide detail for bidding and construction of the project by contractors. Preliminary plans are working documents, hence, they are less formal and are prepared with less detail than are final plans. Because

of the varied nature of highway improvement projects, no single set of requirements can apply to all preliminary plans, therefore, its content should be thoroughly discussed and agreed upon at the project scoping session.

4.2 Design Process

A preliminary plan should be prepared for every project. Preliminary plans should contain enough detail to prepare a R/W plat, if needed, and to prepare an updated cost estimate and construction schedule. The completed preliminary plan is provided to appropriate staff by region design or consultants for review. It is circulated for review, to gain acceptance of, or receive comments on project concepts prior to submitting the DSR for approval/concurrence. The reviewers are then responsible for returning the preliminary plan to region design, or the consultant, within a specified time indicating acceptance or with comments. This process is completed prior to approval of the DSR. The approved DSR along with the preliminary plan, is the point in the facilities development process from which the final design can proceed. The preliminary plan is not an approval document for the Bureau of Project Development.

The preliminary plan process would normally follow these steps.

1. Participants in project scoping agree to the content of the preliminary plan.
2. Prepare the plan based on the checklist prepared during project scoping.
3. Circulate the completed preliminary plan and DSR report to appropriate staff to review for acceptance or comments. Include local units of government if applicable. Indicate response date so all relevant comments can be addressed during this period.
4. Resolve issues and make necessary changes to the preliminary plan and DSR. Preliminary plan changes may be hand written notes and comments since the preliminary plan is intended to be a working document.
5. Submit the DSR for approval/ concurrence. A preliminary plan or portions of it may be included as exhibits to clarify details difficult to describe.

4.3 Content

Attachment 4.1 is a scoping worksheet for developing a preliminary plan checklist. This worksheet is to be used during project scoping to determine the content of the preliminary plan for a specific project. The worksheet is used to determine the adequacy of the preliminary plan submitted. Only items appropriate to a specific project need to be selected. Items unique to a specific project should be added to the list.

LIST OF ATTACHMENTS

Attachment 4.1 Preliminary Plan Worksheet

FDM 15-1-5 Sample Plan: Improvement Projects *March 14, 2016*

This procedure contains examples of typical plan sheets. They are illustrated as follows:

Attachment 5.1	Title Sheet
Attachments 5.2 and 5.3	Typical Sections
Attachments 5.4 – 5.18	Details
Attachment 5.19	Estimate of Quantities
Attachment 5.20	Miscellaneous Quantities
Attachment 5.21	Plan and Profile
Attachment 5.22	Computer Earthwork Data
Attachment 5.23	Cross Sections

The attachments as part of this procedure have been included as typical examples only and are not intended to cover all situations. They should not be used as standard detail drawings or for design criteria. See Chapter 11 for design criteria.

The attachments represent examples of the type of information that should be shown on each category of plan sheet.

Each subject area is further described by a separate procedure, such as FDM 15-1-15, "Typical Section Sheet." An example Right-of-Way Plat is not included here but is illustrated and described in FDM 12-15-1.

Standard Detail Drawings are illustrated in Chapter 16. Sign plates and sign codes are shown in the Federal Highway Administration Manual of Uniform Traffic Control and Standard Highway Signs

http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

and/or the Department's standard sign plate manual:

http://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/signplate/signplate.aspx

A list of sign plates is available from the Signs and Marking Implementation Section in the Bureau of Highway Operations. Structure Plans are described in the Bridge Manual.

LIST OF ATTACHMENTS

Revise 15-1 Attachment 5.4 (Sample Detail Sheet (Construction Details)) by removing one of the two construction details for overhead sign supports.

Attachment 5.1	Sample Title Sheet
Attachment 5.2	Sample Typical Section Sheet (with other Information)
Attachment 5.3	Sample Typical Section Sheet
Attachment 5.4	Sample Detail Sheet (Construction Details)
Attachment 5.5	Sample Detail Sheet (Project Overview)
Attachment 5.6	Sample Detail Sheet (Intersection Layout)
Attachment 5.7	Sample Detail Sheet (Interchange Drainage and Pavement)
Attachment 5.8	Sample detail Sheet (Contour Map)
Attachment 5.9	Sample Detail Sheet (Cross Section Match Line)
Attachment 5.10	Sample Detail Sheet (Erosion Control)
Attachment 5.11	Sample Detail Sheet (Storm Sewer Plan)
Attachment 5.12	Sample Detail Sheet (Planting)
Attachment 5.13	Sample Detail Sheet (Permanent Signing)
Attachment 5.14	Sample Detail Sheet (Lighting)
Attachment 5.15	Sample Detail Sheet (Traffic Signal Plan)
Attachment 5.16	Sample Detail Sheet (Pavement Marking)
Attachment 5.17	Sample Detail Sheet (Traffic Control/Construction Staging)
Attachment 5.18	Sample Detail Sheet (Alignment Plan)
Attachment 5.19	Estimate of Quantities
Attachment 5.20	Sample Miscellaneous Quantities Sheets
Attachment 5.21	Sample Plan and Profile Sheet
Attachment 5.22	Sample Computer Earthwork Data Sheet
Attachment 5.23	Sample Cross Section Sheet

FDM 15-1-6 Sample Abbreviated Plan

September 30, 2008

General The plans for State Highway Rehabilitation-Maintenance (SHRM) Projects, Highway Maintenance Projects and Traffic Maintenance Projects shall be prepared in accordance with FDM 15-1-5. Where applicable, plans for improvement projects of limited scope/complexity may also be prepared as abbreviated plans.

The plans shall be exactly 11" x 17" as E-Plans and should generally be abbreviated versions of an improvement plan. The typical components of an abbreviated plan are a title sheet, typical cross section/miscellaneous quantity listings, estimate of quantities sheet, plan sheets, standard detail drawings and structure plans.

This procedure contains typical examples of plan sheets as shown in Attachment 6.1, 6.2, 6.3 and 6.4.

Projects involving only weed spraying, production of aggregate stockpiles, or production of asphaltic mixes do not require plans.

6.1 Title Sheet

Title sheets for SHRM Projects shall contain the designation State Highway Rehabilitation-Maintenance Project in the project description area. The designation of State Highway Rehabilitation-Maintenance Project shall be deleted from title sheets used for Highway Maintenance Projects and Traffic Maintenance Projects. The only portion of the design designation on the title sheet that needs to be included is that pertaining to average daily traffic for the construction year. Coordinates are not required. Log distance measured to the nearest one hundredth of a mile may be used in lieu of linear feet as the basis for measuring net centerline length.

The signature block shall be revised to provide for the proper authorizing signature as shown in FDM 15-1 Attachment 10.1.

Title sheets for improvement projects shall be prepared in accordance with FDM 15-1-10.

Maintenance Resurfacing projects will have a net centerline length while Maintenance Bridge Rehabilitation and Maintenance Roadway projects will not have a net centerline length. Highway Maintenance Projects and Traffic Maintenance Projects will not have a net centerline length.

6.2 Details

Special details are not normally required since intersections, guardrail, etc., will typically not be upgraded. If any such work is incorporated in the contract, the details should be included.

6.3 Estimate of Quantities

The Estimate of Quantities Sheet is computer generated by Proposal Development Unit following the submittal of the P.S.& E.

6.4 Plan Sheets

When plan sheets are necessary, they may be prepared as conventional plan sheets or as line diagrams. The plan sheets should include the centerline stationing, structure notations, stationing of exceptions and equations and side road locations. Log distance may be used in lieu of centerline stationing on highways where centerline stationing cannot be established from existing plans or surveys.

Superelevations are typically not revised with a maintenance overlay so curve and superelevation data is not required unless changes to the superelevation rate are proposed.

LIST OF ATTACHMENTS

Attachment 6.1	Sample Title Sheet-Abbreviated Plan
Attachment 6.2	Sample Typical Section Sheet -Abbreviated Plan
Attachment 6.3	Estimate of Quantities
Attachment 6.4	Sample Plan Sheet -Abbreviated Plan

FDM 15-1-10 Title Sheets

March 4, 2013

A Title Sheet is required on all contract plans. An example is illustrated in FDM 15-1, Attachment 5.1 and FDM 15-1, Attachment 6.1.

10.1 Project Title

The project title on the title sheet must be consistent with that shown on the Project Summary Screen in FIIPS. If FIIPS does not reflect the desired title, the region planning section can change it or request the Bureau of State Highway Programs in central office to do so.

Urban project titles typically give the name of the road being improved (e.g., West Brown Deer Road) along with the town, village, or city name when applicable; followed by a subtitle that defines the general limits of the work (e.g., N. 92nd Street-N. 68th Street).

Rural project titles typically identify the project location by giving its termini (at or beyond the construction limits) using the names of municipalities, highways, rivers, county lines, etc. (e.g., Cedarburg-Grafton Road, South County Line-S.T.H. 76 Road).

These termini should be identifiable on an ordinary state highway map. If the terms "beltline" or "bypass" are used in the title, it should be recognized that "beltline" applies to a circumferential route. The term "bypass" should be used with discretion, as to some communities this may have a negative connotation. Subtitles are used if the project limits need further definition. The titles and subtitles should be based on the cardinal direction

of the highway route.

10.2 Project Numbers

The state project number must appear on the title sheet in the box in the top right corner. This number is assigned by the region planning personnel.

The state project number and county name shall be shown in the left binder margin with lettering approximately one half inch in height and readable from the left edge of the plan.

If federal funds are involved, a federal project number is required and will be added by central office in the top right corner with the corresponding state project number(s). If a federal project number encompasses more than one contract, a federal contract number is assigned and will be placed in the top right corner by central office.

10.3 Margin Information

Add the following information in the left margin of the title sheet. Data fields have been established in the plan sheet cell files for this information.

Project ID: enter the state project ID number(s) of all projects in the plan set.

County: enter the county(ies) where the work will be done.

With: enter the project ID's of all additional plan sets that will be let with the subject plan set. Enter "N/A" if the contract consists of only one plan set.

10.4 Order of Sheets

This information is for section reference.

10.5 Location Sketch

A base map of appropriate scale, size, and detail to show nearby cities, villages or other landmarks should be used to identify where the project is located without requiring reference to other maps.

These maps should use one of the scales shown below with the project location accented.

Table 10.1 Project Scales

Rural:	1 inch = 1 mile 1 inch = 2 miles 1 inch = 4 miles
Urban:	1 inch = 500 ft 1 inch = ½ mile

The following items should also be indicated:

Begin Project and End Project: Describe by station or log distance where applicable, and reference line label. The state project number is not required unless there are two or more projects listed on the title sheet.

Coordinates shall be calculated from a survey and shall be shown on all projects at the "Begin Project" location. They shall be referenced to the Wisconsin County Coordinate System or an alternate approved coordinate system (see FDM 9-5-10). All coordinates shall be grid coordinates and indicated by "Y" and "X".

Equations: Show all station equations greater than 100 feet.

Place Names: Label counties, municipalities, and towns and ranges, as appropriate.

Road Identifications: On small-scale sketches all county, state, and federal highways should be labeled. On larger scale sketches street names within the immediate area of the project should also be shown. The names of all roads and streets that are referred to in the Special Provisions should be shown.

North Arrow: A north arrow is required. It is also required on every plan sheet depicting horizontal or plan layout where cardinal direction is important.

Scale of Sketch: A graphic scale shall be placed directly beneath the sketch.

Structure Numbers: Structures on which work is to be done shall be described by their structure number and reference line label showing location.

10.6 State Map

Indicate the county or counties in which the project is located by crosshatching the appropriate county areas.

10.7 Design Designation

The Design Designation is required to be shown on all projects except those for which the type of work is unrelated to capacity or traffic volume of the highway (e.g., landscaping, erosion control, signing, lighting, maintenance projects, etc.).

The annual average daily traffic for the construction year will be required on all projects.

AADT: Annual Average Daily Traffic (indicate the construction year).

AADT: Annual Average Daily Traffic (indicate the design year).

DHV: Design Hour Volume (indicate the design year).

D: Directional distribution of traffic (design year).

T: Percent of trucks in DHV (design year) unless indicated as percent of AADT.

Design speed: Miles per hour (mph) or kilometers per hour (km/h)

ESALS: The number of Equivalent Single Axle Loads (ESALS) the design lane is expected to accommodate during the design life of the project. This value is calculated as follows:

ESALS = 365 x A x L where

"A" is the Traffic Analysis Period in years and

"L" is the Design Lane Total ESALS per day.

Both "A" and "L" can be obtained from the WisPave pavement design software. See FDM 14-15-10.

Note: An ESALS value is required on only those improvement projects that include Asphaltic or Concrete pavements. For all other projects just note "N/A."

10.8 Net Length of Center Line

Total net length of center line is listed for every contract plan to the nearest thousandth of a mile. The net length is subdivided as follows when applicable:

State Project Number: Net length is listed for each project if there are two or more projects.

0.000 Miles Net Length of Center Line: Project length is 0.000 mi in the following situations:

- The improvement crosses the project route.
- The improvements are intermittent along the route or routes (spot locations only).
- The improvements involve park roads, institution roads, waysides, or rest areas.
- The improvement involves miscellaneous construction (e.g. highway lighting).
- State Highway Rehabilitation-Maintenance projects (SHRM), Bridge Rehabilitation (MAIN) projects and Maintenance Roadway (MAIN) projects. Exception: (SHRM) Maintenance resurfacing (I000) projects are required to show an accurate project length.
- Maintenance projects (projects with 00XX type project numbers administered by Maintenance or Traffic).
- When dual roadways are built at separate times, the roadway built along the auxiliary reference line will have zero length.

10.9 Conventional Symbols

Commonly used symbols are preprinted on the title sheet. Additional symbols may be found in FDM 15-5-30 and should be added below the preprinted symbols on the title sheet when appropriate.

10.10 Signatures

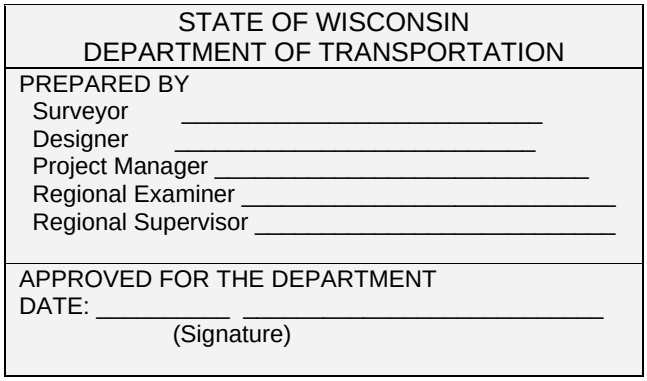
The Department establishes the following meanings for the signatures that appear on the title sheet.

Table 10.2 Title Sheet Signatures

1. Consultant Prepared Plans		
Who	Action	Meaning
a) Consultant	Prepared By	By signing and sealing, the Consulting Engineer is attesting to the engineering integrity and accuracy of the plan, including proper concern for public health, safety and welfare. This action constitutes the practice of engineering and the responsibilities attendant thereto, per Chapter 443 Wisconsin Statutes.
b) Municipality	Accepted	Municipality is accepting the plan as to concept, general intent, general standards, line, grade and related details.
c) Region (For STH work or local work when management consultant not used) or Management Consultant	Approved By	In approving a consultant plan the region or management consultant is generally approving the concept, general project intent, etc, as well as approving the project for submittal and letting.
2. Department Prepared Plans		
The Department practices engineering and accepts the responsibilities attendant to Chapter 443, Wisconsin Statutes.		
Who	Action	Meaning
a) Region	Prepared By or Checked By	Names (not initials) of persons closest to the work should appear in these blocks. Need not be a Professional Engineer.
	Approved By	Endorses or accepts concept standards, and general project intent as being appropriate. region person "in responsible charge of project" should sign. Must be a Professional Engineer. Discretionary – Region Director designates level.
3. Municipality Prepared Plans		
Who	Action	Meaning
a) Municipality	Prepared By	Same as Consultant.
	Accepted	Municipality is accepting the plan as to concept, general intent, general standards, line, grade and related details.
b) Region (for connecting highway, or local work when Management Consultant is not used) or Management Consultant	Approved By	In approving a municipality plan the region or Management Consultant is generally approving the concept, general standards, general project intent, etc., as well as approving the project for submittal and letting.

10.11 Signature Blocks

All STH and connecting highway P.S.& E.s submitted to central office shall use the signature block shown in Figure 10.1. This includes all construction, traffic and maintenance projects. Figure 10.1 is reserved for WisDOT staff only.


STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

PREPARED BY
Surveyor _____
Designer _____
Project Manager _____
Regional Examiner _____
Regional Supervisor _____

APPROVED FOR THE DEPARTMENT
DATE: _____ _____
(Signature)

Figure 10.1 Signature Block for STH & Connecting Highway Projects

The following signature blocks are to be used for projects on local roads:

- With a management consultant (see Attachment 10.1, Detail A): Approved by the person in responsible charge of the project as designated by the management consultant.
- Without a management consultant (see Attachment 10.1, Detail B): Approved by the person in responsible charge in the region as designated by the Region Director.

See FDM 15-5-5 for title sheet cells containing these signature blocks. Other combinations of signatures may be required depending upon the circumstances.

The signature block also provides for the names of region personnel directly involved in the preparation and processing of the plans. These must be filled in.

Two other types of signature blocks may also be required, as shown in Attachment 10.2, Details A and B. These blocks should be placed above the standard signature block. Note: When the plans have been prepared by a consultant, the "Original Plans Prepared By" portion of Detail A would be replaced by Detail B.

- Plans Prepared and/or to be Signed by Cities, Villages, Counties or Towns (See Attachment 10.2, Detail A): If the plans were prepared by the city, village, county or town, the signature and professional seal of the professional engineer in responsible charge must be included. The plans shall also be signed by the city, village, county or town official.
- Plans Prepared by Consultants (See Attachment 10.2, Detail B): If the plans were prepared by a consultant, the consultant's name, professional seal, and signature must be included. The consultant's logo may also be shown in this signature block if it does not interfere with the information that is required to be shown on a title sheet.

10.12 Special Notes

Place one of the following notes on the title sheet based on the coordinate system used in the plan.

- *Coordinates on this plan are referenced to the Wisconsin State Plane Coordinate System (North/Central/South) Zone.*
- *Coordinates on this plan are referenced to the Wisconsin County Coordinate System, (county name) County.*
- *Coordinates on this plan are referenced to an assumed coordinate system.*
- *Coordinates are scaled from U.S.G.S. Topographic Map (_____), Wisconsin Quadrangle, for identification only.*

LIST OF ATTACHMENTS

Attachment 10.1	Signature Blocks for WisDOT Projects
Attachment 10.2	Signature Blocks for Local Road Projects

FDM 15-1-15 Typical Section Sheet *September 19, 2014*

A typical section is required on all contract plans other than specialty type projects such as planting, marking and signing, etc. The typical section sheet shall follow the title sheet except that typical sections for structures are located with the structure plans.

Generally, the first typical section sheet includes the typical main line section, general notes, a list of unusual or nonstandard abbreviations, and utilities listing. Furthermore, if a plan contains 15 or more of these sheets, the

first sheet should provide an index to all typical section/detail sheets. See FDM 15-1-1 for guidance on indexing typical section sheets.

Additional typical sections may be put on either the first sheet, on subsequent typical section sheets, or combined with construction details. A pavement boring log shall be provided on the typical section sheet for projects containing the item Salvaged Asphaltic Pavement.

A Typical Section Sheet is illustrated in FDM 15-1 Attachment 5.2, FDM 15-1 Attachment 5.3, and FDM 15-1 Attachment 6.2.

Each typical section sheet shall have a title block along the bottom edge of the sheet. The title block shall include the State Project Number(s), space for a sheet number and title.

15.1 Typical Section

An existing typical section shall be shown when work is being done on the pavement or shoulder, the pavement is being removed or the pavement or shoulder is being used to carry traffic.

A main line typical section shall be shown for all applicable projects. Additional typical sections shall be shown for side roads, frontage roads, ramps, driveways and temporary roads where applicable. Ultimate typical sections are required for all stage construction projects.

Each typical section shall utilize the following:

- Scale: The width of section shall be selected to provide clarity of detail. A horizontal scale of one-inch equals five feet is often used on plan sheets. The vertical scale is normally exaggerated such as one-inch equals two feet.
- Slopes: This is expressed as a ratio of horizontal distance to vertical distance. All slopes between edges of shoulder and original ground, and those between edge of shoulders in the median should be labeled. Where slopes are variable, maximum and minimum should be labeled also. A typical section should illustrate both cut and fill sections.
- Cross Slope: This is the amount of rise or fall indicated in percent. The gradient of the finished surface, shoulders and subgrade should be indicated.
- Width: The width of lanes, shoulders, roadbed, ditches, clear zone and median should be shown to the nearest tenth of a foot.
- Material Identification and Thickness: The thickness and type of materials constituting the pavement structure such as 3" HMA Pavement Type E-1 or 6" Base Aggregate Dense 1 1/4-Inch shall be shown. For urban sections other elements such as sidewalk and curb and gutter shall also be shown. Material thicknesses shall be shown to the nearest one-quarter inch (not decimals).
- The limits of topsoiling, salvaged topsoiling, fertilizing, seeding or sodding shall be shown.
- Where variations in material thickness are proposed, these may be shown in tabular form indicating thickness and station limits.
- Pavement ties, tie bars, underdrains, geotextile fabrics, islands, concrete barriers, removals, etc. shall be shown when they are required in the construction.
- Location Limits: Typical sections shall be titled and stationing limits indicated. Minor equations may be omitted. Station limits need not be shown where there is only one typical section per roadway.
- Vertical and Horizontal Reference: All typical sections shall show the relationship between the typical section and the grade line profile shown on the Plan and Profile Sheet with a point referred to on profile note. The vertical relationship between the typical section and the cross sections shall also be shown by a point referred to on cross section note unless indicated on the Cross Section Sheets. Typical sections should also show their relationship to the horizontal alignment reference line.
- Doweled Concrete Pavements: All doweled concrete pavements shall have a notation indicating that dowels are required. An example of such a notation is: Concrete Pavement 10-inch (Doweled).
- Tined Concrete Pavements: All concrete pavements to be tined shall include a notation indicating that tining is required. An example of such a notation is: Concrete Pavement 10-inch (Doweled and Tined).

15.2 General Notes

Information contained in the General Notes is intended to supplement, but should not duplicate, the Special Provisions, Supplemental Specifications, or Standard Specifications. General notes should not contain material that is properly a part of the Standard Specifications, the Special Provisions, a typical section, a detail, the miscellaneous quantity sheets or the plan sheets. They should be kept to an absolute minimum and should not duplicate information contained elsewhere in the plans, proposal or standard specifications. The following is a sample list of general notes that are commonly used:

- Elevations shown on the plan are referenced to the North American Vertical Datum of 1988 (NAVD88).
- Elevations shown on this plan are referenced to an assumed vertical datum.
- Coordinates on this plan are referenced to the North American Datum of 1983 with 1991 adjustment (NAD83(91)).
- Coordinates on this plan are referenced to an assumed horizontal datum.
- The Wisconsin State Plane Coordinate System coordinates shown on this plan are grid/ground values and the combination factor used is xxxxxxx.
- No trees or shrubs are to be removed without approval of the engineer.
- Disturbed areas within the right-of-way, except the areas within the finished shoulder points, shall be fertilized, seeded and mulched.
- The location of driveways will be determined by the engineer.
- Excavation below subgrade (EBS) is not used to balance yardage and is not shown on the cross sections but is measured and paid for as (common, or rock) excavation.
- X-inch HMA pavement shall be constructed with an x-inch upper layer and x-inch lower layer.
- The (paving, grading) contract shall include the backfill for the area behind the curb and gutter (specify appropriate contract when curb and gutter and grading are in separate contracts).
- Construction permits for driveway construction have been obtained and such rights will be extended to the contractor.
- The locations of existing and proposed utility installations as shown on the plans are approximate. There may be other utility installations within the project area that are not shown.

  or

  There are no known utility facilities within the project area.

15.3 Abbreviations

The use of abbreviations in the plan should be kept to a minimum.

Abbreviations found within the plan that would not be readily recognized by the ordinary user of a highway plan shall be shown in an abbreviations listing on the first Typical Section Sheet. Other abbreviations used in the plan shall not be shown on the list. Right-of-way plat abbreviations shall not be included in this listing. FDM 15-5-25 contains a list of standard abbreviations.

15.4 Utilities/Railroads Listing

A list of all utility companies, cooperatives, municipal utilities, and railroad companies whose facilities are located within the right-of-way shall be included on the first typical section sheet. The following shall be included:

1. Utility name
2. Address
3. Telephone number, including area code
4. Contact person or department

For railroad companies the contact person is their local road master. The above information for road masters is available from either the region rail coordinator or the region project development section.

15.5 DNR Liaison

All projects require a WDNR area liaison, address and phone number. A link to the WDNR liaison contacts is in FDM 5-10-1.

15.6 Standard Detail Drawings List

Electronic Plans (EPlans) should not have an SDD list on the first typical section sheet. The SDDs should be specified in the SDD Spreadsheet and the spreadsheet must accompany the EPlan (see FDM 15-5-15). Central office staff will include the SDD list at the appropriate time.

15.7 Sign Plates

The P.S. & E. Plan Letter (see FDM 19-10-15) shall include a notice that central office will insert sign plates if applicable. No listing of sign plates is provided in the plan.

Department sign plates are to be used for permanent highway signs. They will be furnished by Bureau of Highway Operations and inserted into the plan, along with traffic control signs not contained in the Manual of

Standard Highway Signs, by the Proposal Management Section during precontract administration activities.

Sign plates shall be included in local road projects when E-submitted for final PS&E.

FDM 15-1-20 Detail Sheet

March 14, 2016

Detail sheets immediately follow or are combined with typical section sheets in a contract plan. Information placed on these sheets supplement or complement the plan and profile sheets or other elements of the plan. Details will be referred to as construction details or layout details.

Construction details focus on a particular item or associated items in a specialized area. Typical examples of construction details would be driveways, concrete steps, riprap, sod, flumes, pipe underdrain and stone walls.

Layout details show the detail and layout for a sizeable area of construction. Typical examples of layout details would be intersections, interchanges, contour maps, cross section match line, erosion control and drainage, storm sewer and utilities, planting, signing, lighting, traffic signals, pavement marking, traffic control and construction staging, fencing and alignment.

Each detail sheet shall have a title block along the bottom edge of the sheet. The title block shall include the State Project Number, space for a sheet number, and the title of the major item or items shown on that sheet.

Examples of Detail Sheets are illustrated in FDM 15-1-5.

20.1 Project Overview

Projects of a complex nature with interchanges, frontage roads and numerous streets and/or side roads should have an overall view of the entire project on one sheet. It should show and label all the highways, streets, ramps, frontage roads, city or village limits, rivers, landmarks and other pertinent information relating to project orientation.

See FDM 15-1 Attachment 5.5.

20.2 Construction Details

Construction details are required for bid items that require detailing not covered in the standard detail drawings or other plan elements.

There is no standard format for construction details. They should be kept simple and should avoid duplication with standard detail drawings or plan and profile sheets. Choose a scale that will sufficiently display the detail. A title is required for each detail. If more than one detail is shown on a sheet the details should be separated by lines.

If control points and associated tie points are not shown on an alignment sheet or plan and profile sheet, a construction detail showing these shall be added. The control points should be shown graphically with Wisconsin State Plane Coordinate System ground coordinates (N,E) or Wisconsin County Coordinate system coordinates (X,Y) shown on the appropriate sheet.

Certain specialized construction details for projects such as planting, traffic signals, signing, pavement marking, electrical work, rest areas and waysides are available through the Bureau of Highway Operations and can be obtained upon request.

When a beveled structural plate culvert (circular or arch shape) is used in a plan, a detail should be included which indicates the total structure lengths (top and bottom) given to the nearest foot. Also to be indicated are span and rise (or diameter), radii of curvatures, skew angle (if not 90° to reference line), plate thickness and corrugation (2-inch x 6-inch etc.), and end treatment (angles of bevel and/or skew). Include details of end protection (sod, riprap, or concrete). Beveled ends should be reinforced with masonry or concrete collars when the bevel is flatter than 2:l and the skew angle exceeds 20°.

Construction details are illustrated on FDM 15-1 Attachment 5.4.

20.3 Typical Sections

See FDM 15-1-15 for guidance on the contents of this detail sheet.

20.4 Intersection and Interchange

Intersections, other than the standard types shown on the standard detail drawings, shall be shown on detail sheets separate from the plan and profile sheets.

Interchange details shall also be shown on detail sheets separate from the plan and profile sheets.

The intersection and interchange details shall show the pavement and shoulder widths, curb and gutter, curve

radii, pavement grades, manholes and inlets, culvert pipe, islands, medians, tapers and other pertinent information. The scale should be 1"=50' or larger.

All interchange details or other layout details not showing the full interchange or layout details on that sheet shall have a small line diagram of the full interchange or layout detail with the detailed portion shown by a darker line or other distinguishing designation on each layout detail sheet.

See Attachment 5.6 and Attachment 5.7.

20.5 Contour Maps

Contours may best exhibit the finished grade elevations of intricate work such as intersection areas, rest areas, waysides, interchanges, special landscape grading, and special drainage grading.

Special contour maps, when provided, should include the existing features and the finished contours of the proposed improvement. Contour lines should not obscure pertinent topographic or design features. The contour lines should be labeled at the appropriate intervals.

See Attachment 5.8.

20.6 Cross Section Matchline

Interchanges and complex intersections should have a cross section matchline detail for use in computing cut and fill yardage. The details may be shown separate on a detail sheet or combined with another detail. It should show the stationing and distances to the matchline and other pertinent information necessary to compute the cut and fill yardage. This detail is not necessary if the matchlines can be properly shown on the cross sections.

See Attachment 5.9.

20.7 Erosion Control and Drainage

Erosion control and drainage shall be shown on separate detail sheets or on the plan sheets. Projects with complex erosion control and drainage patterns, such as interchanges, should be shown on a separate detail sheet. The detail should show the drainage pattern with direction of flow, drainage structures and erosion control features. Erosion control features consist of silt fence, erosion mat, erosion bales, sod, reinforced sod, riprap, intercepting embankments, ditch dikes, paved flumes and other necessary erosion control items. The slope intercepts should also be shown. See FDM 10-5 Attachment 60.1 for a checklist of items required in an erosion control plan.

See Attachment 5.10.

20.8 Storm Sewer and Utilities

The plan and profile of storm sewers and utilities shall be shown on detail sheets separate from the plan and profile sheets.

The plan view shall show the location of manholes and inlets, existing underground utilities, storm sewers and other information pertinent to the storm sewer system. The scale should normally be 1"=50' or larger.

The profile shall show the existing ground, existing utilities if available, flow line grades, the profile of the storm sewer, manholes and inlets, the size, type and grade of the storm sewer, and the manhole and inlet grades. The scales should normally be 1"=50' horizontally and 1"=5' vertically or larger.

See Attachment 5.11.

20.9 Planting

Planting is the furnishing and planting of trees, shrubs, vines, herbaceous plants and special seed mixtures.

When planting is included under a contract with other construction operations such as grading, base, paving, etc., the planting shall be shown on detail sheets separate from the plan and profile sheet. The planting may be combined with other details such as intersection and interchange details, when appropriate.

If the planting is let as a separate contract, the planting layout detail sheets will become the plan sheets.

Planting layout details shall show the location of plants and plant beds, species and size of plants, the quantity of each planting, root condition and other pertinent planting information. The common name for trees, shrubs and vines shall be used on the planting layout details and shall be referenced to the plant data chart.

See Attachment 5.12.

20.10 Permanent Signing

Revise 15-1-20.10 (Permanent Signing) to add/repair links and add note regarding fatigue loads.

All permanent signs are usually replaced on Let projects for the whole segment of the project, although, engineering judgment has to be exercised on the part of the Region to determine the feasibility of this type of replacement. This includes roadway reconstruction, recondition, pavement overlays, base patching and joint repair projects. Exceptions to this policy include:

- It is not required to replace permanent signs on non-pavement-preservation preventive maintenance projects (see FDM 3-1-5), and
- It is not required to replace permanent signs on Group 3 pavement-preservation preventive maintenance projects (see FDM 3-1-5 - work consists of milling, rut filling, seal coating, micro-surfacing and crack filling projects) because:
  - When Group 3 pavement strategies are applied early in the pavement life cycle, most signing should still be in good condition.
  - The work can easily exceed 10% of the project, i.e., it would not meet the requirement for incidental construction.

In general, all new Type I signs have Type SH (super high intensity prismatic) sheeting, except yellow Type I signs and plaques, which are Type F (fluorescent high intensity prismatic) sheeting. For all new Type II and Type III signs, Type F sheeting shall be used for all orange work zone signs, all yellow W series signs, and all fluorescent yellow-green S series signs. Type H (prismatic high intensity) sheeting shall be used for all other Type II and Type III signs (see FDM 11-50-55).

Careful attention needs to be given to signs at intersections on OSOW vehicle routes. Periodically signs and posts may have to be temporarily removed to accommodate vehicles passing through the intersection and turns properly. The designer should refer the OSOW freight network maps in FDM 11-25-1.4 and contact the Region freight coordinator to confirm if the project is located on an OSOW vehicle route. Confirm the proposed post type on these routes with Region Traffic Operations.

If conflicts may occur with signs at intersections on OSOW route, tubular steel signposts assemblies should be considered for signs that could be impacted by an OSOW vehicle. If removable signs are needed, install tubular steel sign post assemblies in accordance with Standard Spec 634.3.2 and standard sign plate A4-9. Access the sign plate manual at:

http://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/signplate/signplate.aspx

Place notes on the permanent signing plan to notify contractors of the required height of the top of the anchor system.

Use the bid items in Table 20.1 for permanent signing:

***Table 20.1* Permanent Signing Bid Items**

Item Number	Description	Unit
637.1210	Signs Type I Reflective H	SF
637.1220	Signs Type I Reflective SH	SF
637.1230	Signs Type I Reflective F	SF
637.2110	Signs Type II Non Reflective	SF
637.2115	Signs Type II Non Reflective Folding	SF
637.2210	Signs Type II Reflective H	SF
637.2215	Signs Type II Reflective H Folding	SF
637.2220	Signs Type II Reflective SH	SF
637.2225	Signs Type II Reflective SH Folding	SF
637.2230	Signs Type II Reflective F	SF
637.2235	Signs Type II Reflective F Folding	SF
637.3110	Signs Type III Non Reflective	SF
637.3210	Signs Type III Reflective H	SF
637.3220	Signs Type III Reflective SH	SF
637.3230	Signs Type III Reflective F	SF

Follow the guidelines below to help determine if replacement of signs on an improvement project is feasible.

Type I signs

1. Overhead Type I guide signs should be replaced in qualifying improvement projects. The recently published FHWA minimum sign retroreflectivity standards do not permit the usage of Engineer Grade or Encapsulated Lens high intensity sheetings for overhead guide signs. Exceptions to replacement of overhead mounted Type I guide signs can be made if the overhead Type I guide signs are prismatic high intensity sheeting or above and there is another improvement project programmed or scheduled on the same roadway segment within the next five years. Any signs not conforming to WisDOT and MUTCD policies **shall** be replaced in the improvement project. **Any exceptions to replacement of Type I signs shall be coordinated with the Region Traffic Engineering Supervisor.**
2. In general, ground mounted Type I guide signs should be replaced in qualifying improvement projects. Exceptions to replacement of ground mounted Type I guide signs *may* be made if signs will be replaced in another improvement project that is programmed or scheduled on the same roadway segment within the next five years. Any signs not conforming to WisDOT and MUTCD policies **shall** be replaced in the improvement project. **Any exceptions to replacement of Type I signs shall be coordinated with the Region Traffic Engineering Supervisor.**
3. Galvanized steel I-beams should only be replaced if Type I signs are not at the proper offset (30 foot desirable / 17.5 foot minimum offset from edge line to edge of sign) or if the new Type I sign is larger. All corten steel I-beams and bases **shall** be replaced.
4. Steel I-beams and bases that are re-used should have the base bolts replaced by utilizing bid item 635.0300 (Sign Supports Replacing Base Connection Bolts).
5. Below are the guidelines for calculating miscellaneous quantities for steel I-Beams, concrete masonry and reinforcing steel for Type I sign supports.

   Quantities for Sign Supports Structural Steel HS (Bid Item 635.0200)

   Determine Length of I-beams.

   1. Determine Type of I-beams (Type A, B, C, D or E). Utilize A3-2 and A3-3 sign plates to determine I-beam type which is based on horizontal and vertical dimensions of Type I sign.

2. Determine weight of I-beams from A3-1 plate.
    a. Type A is 12.0 lbs per foot.
    b. Type B is 16.0 lbs per foot.
    c. Type C is 19.0 lbs per foot.
    d. Type D is 22.0 lbs per foot.
    e. Type E is 26.0 lbs per foot.
3. Add “K” value to each I beam weight calculated in step 3. The K value is the weight for the stub, base plates, stiffeners, bolts and washers.
    a. Type A post K value is 76.0 lbs.
    b. Type B post K value is 146.5 lbs.
    c. Type C post K value is 182.1 lbs.
    d. Type D post K value is 210.5 lbs.
    e. Type E post K value is 293.0 lbs.

Quantities for Sign Supports Concrete Masonry (Bid Item 636.0100)

1. Type A base is 0.6 CY for each base.
2. Type B base is 0.8 CY for each base.
3. Type C base is 0.9 CY for each base.
4. Type D base is 0.9 CY for each base.
5. Type E base is 1.0 CY for each base.

Quantities for Sign Supports Steel Reinforcement (Bid Item 636.0500)

1. Type A base is 34 lbs for each base.
2. Type B base is 49 lbs for each base.
3. Type C base is 50 lbs for each base.
4. Type D base is 56 lbs for each base.
5. Type E base is 62 lbs for each base.

Type II signs

1. All Type II signs should be replaced in qualifying improvement projects. The recently published FHWA minimum sign retroreflectivity standards do not permit the usage of Engineer Grade on warning and guide signs. It is also WisDOT policy to not use Engineer Grade on any signs, including regulatory signs.
2. *Any exceptions to replacement of Type II signs shall be coordinated with the Region Traffic Engineering Supervisor.* Exceptions for replacement of Type II signs *may* be made if the following criteria are met:
    1. If signs that will be replaced in another improvement project that is programmed or scheduled on the same roadway in the next five years.
    2. If existing Type II signs are not damaged or have any other material defects.
    3. If sign size, mounting height and lateral offset still meet WisDOT standards.
    4. If sign message still conforms to WisDOT and MUTCD policies and minimum retroreflectivity requirements

When permanent signing is included under a contract with other construction operations such as grading, base, paving, etc., the permanent signing shall be shown on signing plan detail sheets separate from the plan and profile sheets.

If permanent signing is LET as a separate contract, the permanent signing layout detail sheets will become the plan sheets.

Permanent signing layout details shall show the location of sign bridges, sign bridge numbers, new signs,

moving signs, removal of existing signs, revision of existing signs, signs being furnished or moved by others, delineators and other pertinent signing information.

Designers should contact the region signing staff on Type II signpost preferences. Do not use 4” x 4” wood posts on new permanent sign installations.

If the project contains specific information signs (SIS - the blue informational signs for gas/food/lodging, etc.) that will be affected by the project, then the designer shall include special provision 638-010 (Blue Specific Service Signs).

Any tourist oriented directional signs (TODS) or white arrow boards present within the project limits can be removed and reinstalled by the contractor. The contractor is responsible for any damage to the signs during this time.

A pictorial drawing of the signs shall appear on the sign layout sheets. A legend with pictorial drawings on each sign layout sheet is also acceptable. Each sign pictorial drawing shall be designated by standard sign code as shown on the department’s Sign Plate book. Number each sign location on the sign layout sheet to refer to the signing miscellaneous quantities. Show the sign size and/or sign size code below the sign code. Specialized or additional information about a sign can be shown on either the miscellaneous quantity sheet or the sign layout sheet. Notes showing existing signs, moving signs and removing signs should appear on the signing plan sheet only. Pictorial drawings of signs are available from the Traffic Design Unit of the Bureau of Traffic Operations, (608) 245-5345, and will be prepared upon request. A minimum of three weeks lead-time is required by central office for the preparation of sign details. The Wisconsin Department of Transportation “Traffic Guidelines Manual “gives guidance for optimum sizes of signs for roadways and sizes of stop signs that should be used at roadway intersections. The “Traffic Guidelines Manual” is available at:

http://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/tgm/tgm.aspx

Permanent signing miscellaneous quantities shall show a location referencing the sign to the sign layout sheet; a sign offset distance for Type 1 signs only (if applicable), sign code, sign size, sign message, and all applicable signing and post quantities. Any remarks/comments concerning permanent signing can be noted in the miscellaneous quantities or on the signing plan sheet. Contact the region signing/marking Engineer for miscellaneous quality preferences.

When overhead sign supports are specified in the plan, the location of the overhead sign supports should be noted on the sign layout sheets as well as noted in the remarks for the signing miscellaneous quantities. A detail showing the layout of the overhead sign support in relation to the roadway shall be shown in the construction details of the plan or structure plans (see FDM 11-50-20.1.2). The following information is required on this detail in order for the contractor to fabricate the overhead sign support:

- The sign sizes and location on the structure as well as their relation to the traffic lanes below.
- The high point of roadway elevation and the top of concrete base elevation or the relative difference in elevation between the two.
- The required minimum vertical clearance from the high point of the roadway to the low point on the sign/structure. Show signs centered on the horizontal arm.
- Horizontal dimensions of the roadway typical section, including cross slopes.
- The location of the structure by station and, if applicable, by highway and crossroad.
- The identification number of the structure.
- The number of chord elements for the horizontal arm or span. Indicate round chords with web members attached by gusset plates when a two-chord system is used. Refer to FDM 11-55-20 for a discussion of the configuration of the overhead sign support and design limitations.
- For small LED or changeable message signs, show the length x width x thickness and its weight.
- The base design, either site specific or a standard detail drawing.
- State the Fatigue Category, in the case of cantilever overhead sign supports, on the plans.

The following notes are to be shown on State Contract Plans containing overhead sign supports.

1. Provide an identification plaque for all overhead sign supports.
2. Design new Overhead Sign Supports according to the latest edition of the State of Wisconsin “Standard Specifications For Highway and Structure Construction” and AASHTO “Standard Specifications for Structural Supports For Highway Signs, Luminaires, and Traffic Signals, 6th Edition and interim revisions. Fatigue loads are not applicable to the design of full span overhead sign supports mounted on top of standard concrete bases.

3. Size the anchor rod / template assembly to fit within the bar cage of the footing base shown in the contract plans in addition to meeting all applicable design requirements for the design of the upright base connection.
4. Design the structure base plate connection to accommodate a minimum of six (6) anchor rods.

See the following attachments for examples of a permanent signing layout:

- Attachment 5.4, shows a sample overhead sign support detail drawing with a base that meets the design criteria in the 24" Diameter Cantilever Overhead Sign Support Base.
- Attachment 5.13, page 1 shows a sample permanent signing plan sheet for freeways and ramps.
- Attachment 5.13, page 2 shows a sample permanent signing plan sheet for a conventional low speed roadway.
- Attachment 5.20, pages 5 and 6 show sample miscellaneous quantity sheets for permanent signing.

20.11 Lighting

When lighting is included under a contract with other construction operations such as grading, base, paving, etc., the lighting shall be shown on detail sheets separate from the plan and profile sheets. The lighting may be combined with other details such as the intersection and/or interchange details, when appropriate.

If the lighting is let as a separate contract, the lighting layout detail sheets will become the plan sheets.

Lighting lay-out details shall show the location of conduits, cables, wires, concrete bases, poles, mast arms, luminaries, transclosures, pull boxes, circuits, pole identification numbers, lighting unit codes, control cabinets, existing electrical facilities and other pertinent lighting information.

See FDM 15-1 Attachment 5.14.

20.12 Traffic Signals

Traffic signal layout details shall be shown on detail sheets separate from the plan and profile sheets.

The traffic signal detail shall show the location of pull boxes, controllers, concrete bases, conduit, standards, poles, mast arms and loop detectors; the location, arrangement and direction of signal heads; the size of such items as conduit, loop detector, etc; and other pertinent traffic signal information.

State owned traffic signals shall be signed (initialed) and dated by both the Region Signals Engineer and the State Traffic Signals Systems Engineer.

Sequence of operation, controller logic, detector logic and cable layout shall be shown in tabular form.

See FDM 15-1 Attachment 5.15.

20.13 Pavement Marking

When pavement marking is included under a contract with other construction operations such as grading, base, paving, etc., the pavement marking shall be shown on detail sheets separate from the plan and profile sheets. The pavement marking may be combined with other details such as the intersection and\or interchange details, when appropriate.

If the pavement marking is let as a separate contract, the pavement marking layout detail sheets will become the plan sheets.

Intersections, gore areas, parking lots, paved medians and lanes with words and arrows are typical areas where pavement marking layout details are required.

These details shall contain adequate information to layout the pavement marking.

No passing zone criteria should be obtained from region traffic for the preparation of no passing markings.

See FDM 15-1 Attachment 5.16.

20.14 Traffic Control/Stage Construction

Traffic control/stage construction details shall be included in all plans except where the necessary information is provided by the standard detail drawings. These details shall be shown on detail sheets separate from the plan and profile sheets. These details shall include the location of traffic control signing, pavement markings, drums, barricades, safety barriers, arrow boards, temporary pavement marking, construction areas, direction of traffic and other pertinent traffic control information. Traffic control devices that are in place and the party responsible for their maintenance should be noted on the details.

The location of established detours shall be shown on the traffic control/stage construction layout details. Work

being performed on the detour by parties other than the contractor should be noted on the details.

The sign layouts and sign code numbers used in the traffic control layout details shall be in accordance with the Federal Highway Administration Manual of Standard Highway Signs. If a desired sign is not contained in the Manual, then a department sign plate shall be specified.

Usually all warning signs in construction zones have an orange background. The Federal Highway Administration Manual of Standard Highway Signs lists most of the orange background signs commonly used in construction zones with a beginning sign code of "W". However, there are signs with other background colors listed in the Manual with a beginning sign code of "W" that may be used in construction zones. These signs shall be labeled with a beginning code of "WO".

The traffic control/stage construction layout details shall include the following notes when appropriate.

1. All signs are 48-inch x 48-inch unless otherwise noted. (This note may be used in place of labeling the size of each sign. Any other size of sign must be individually labeled.)
2. "WO" signs are the same as "W" signs except the background is orange.

See FDM 15-1 Attachment 5.17.

20.15 Fencing

Fencing layout details shall be included on projects where the right of way is required to be fenced. The details may be shown on separate detail sheets, combined with other details or shown on the plan sheets. The location of the fence shall be referenced with dimensions to the reference line or right of way line.

20.16 Alignment

For projects with complex alignment, such as interchanges, a separate alignment detail shall be included. The detail should show reference lines, survey lines, stationing (and equations), points of intersection, points of curvature, points of tangent, bearings, curves, etc. Curve data, offset data, coordinates referenced to the Wisconsin Grid Coordinate System, ties, and other pertinent data should also be included.

The control points shall be shown graphically with Wisconsin State Plane Coordinate System ground coordinates (N,E) or Wisconsin County Coordinate System coordinates (X,Y) so the initial layout construction staking can be performed.

See FDM 15-1 Attachment 5.18.

20.17 Other Details

Layout details may also be required showing environmentally sensitive areas, soil boring or sounding locations, pipe underdrain and other pertinent information necessary for the bidding of the contract and construction of the highway. These details may be combined with other details, when appropriate.

FDM 15-1-25 Estimate of Quantities Sheet

December 13, 2006

An Estimate of Quantities Sheet is required for all bid contract plans. It is prepared by the Proposal Development Unit following submittal of a P.S. & E., and is computer generated from Trns•port. It is shown in FDM 15-1 Attachment 5.19. This computerized printout lists quantities by bid item and project number only. A breakdown of items by category shall be shown on the Miscellaneous Quantity Sheet.

Local Force Account and state forces contracts are the only exception to using a computer generated estimate of quantities sheet. The Estimate of Quantity list for these contracts shall be manually prepared as shown in Figure 25.1. It shall be a one lump sum item for the type of work that is being performed. The list should be placed in a convenient place on the title sheet or second sheet of the plan.

Item Title		TRAFFIC SIGNALS
	Item No.	SPV.0105.01
	Unit	LUMP SUM
PROJECT 2290-01-02		1
Total		1

Figure 25.1 Estimate of Quantities

FDM 15-1-30 Miscellaneous Quantities Sheet

December 3, 2008

A miscellaneous quantities sheet is required on all projects that have bid items needing a detailed breakdown. See FDM 15-1 Figure 5.20 for an example of a miscellaneous quantities sheet.

Each miscellaneous quantities sheet shall have a title block along the bottom edge of the sheet. The title block shall include the State Project Number(s) and space for a sheet number. If the title Miscellaneous Quantities is not preprinted on the sheet, it should be included in the title block.

A detailed breakdown of bid items is required to readily show the location, size, quantity and other pertinent information. It is needed to supply information to those who review the plans, bid the contract, supply materials, construct the project, etc. Examples of work requiring detailed breakdown of bid items on the miscellaneous quantities sheet are removals, earthwork, bases, pavements, drainage structures and incidental construction items. These listings shall be placed on the miscellaneous quantities sheet in numerical order of their bid items numbers beginning at the top left of the first sheet.

A detailed breakdown of structure items should be shown on the structure plans and not repeated on the miscellaneous quantity sheets.

Bid items such as Finishing Roadway, Maintenance and Repair of Haul Roads, Mobilization and some other lump sum items are not required to be shown on the Miscellaneous Quantities Sheet. "Lump Sum" or "Each" items such as Grading and Shaping Intersections or Grading Shaping and Finishing for Barrier Terminals shall be shown with the estimated quantities of materials incorporated into the item.

If a bid item is included in more than one category on the estimate, the distribution of the item by categories shall be shown on the miscellaneous quantities sheet. A subtotal for each category shall also be shown as well as an overall total for the bid item. See Figure 30.1.

The bid items shall also be separated by construction stages and projects. Bid item subtotals shall be shown for each project.

The typical format for a given item should include location, size, quantity, category, project number (if more than one), construction stages, remarks, and any other description that may clarify the miscellaneous quantities. The table for each bid item shown on the miscellaneous quantities sheet shall include the contract total shown for that item. When showing categories, show the complete four-digit category number (e.g., 0010, 0020, etc.).

A detailed earthwork summary table shall be shown in the miscellaneous quantities section of the plan for all projects involving grading. The earthwork summary table is a summary of the data from all of the earthwork data tables and identifies the contract quantities of all earthwork bid items. Each earthwork data table should be represented by one line in the earthwork summary table. The earthwork summary should identify for each segment: earthwork division, station to station location, applicable volumes of common excavation (cut and EBS excavation), salvaged/unusable pavement, available material, marsh excavation, rock excavation, reduced marsh in fill, reduced EBS in fill, expanded marsh backfill, expanded EBS backfill, expanded rock, unexpanded fill, expanded fill, mass ordinate, waste, borrow, and any comments needed to clarify the information in the table. If a project includes more than one division of earthwork, each division will be identified and treated as a separate entity in the earthwork summary table.

The following is further clarification on each of these columns in the earthwork summary table:

1. **Division** - Typically a project will only have one earthwork division. Staging needs or physical barriers

may require a project to be separated into more than one division.

2. **Station to Station and Location** – Identifies the segment of the earthwork being analyzed in the line of the summary table. Each line in the summary table will correspond to the totals for each earthwork data sheet.
3. **Common Excavation (Cut and EBS)** – Cut includes the sum of all items, except EBS, that are paid for as common excavation (also includes all salvaged/unusable pavements). EBS includes the volume of any identified or estimated excavation below subgrade (EBS). Both “cut” and “EBS” are paid for as common excavation.
4. **Salvaged / Unusable Pavement material** – Include this column only if there is salvaged / unusable concrete or asphalt pavement that is included in the common excavation. This column identifies the quantities of any salvaged or other concrete or asphalt pavement that will not be used in the fill.
5. **Available Material** – Include this column only if there is salvaged/unusable pavement that will not be used in the embankment. This includes only the portion of the cut that is available to be used in the embankment. (Salvaged/unusable pavements that will not be used in the embankment are subtracted from the “cut”).
6. **Marsh Excavation** – Include this column only if there is marsh excavation specified in the contract.
7. **Rock Excavation** – Include this column only if there is rock excavation specified in the contract.
8. **Reduced Marsh or EBS in Fill** – Include these columns only if marsh or EBS excavation will be used in the fill outside of the 1:1 slope. These columns identify the volume that the marsh or EBS will occupy in the fill.
9. **Expanded Marsh Backfill** – Include this column only if there is marsh excavation identified in the contract. This column identifies the volume of material required to backfill the marsh. This accounts for the shrinkage of the backfill material, the displacement of the marsh during the excavation and backfilling process, and the placement of one foot of select borrow or granular backfill placed above the marsh if the contract specifies granular backfill or select borrow for the marsh. The expanded marsh backfill is computed by multiplying the volume of marsh excavation times the marsh backfill expansion factor. If granular backfill or select borrow is specified for backfilling the marsh, this represents the quantity of the granular backfill or select borrow to backfill the marsh, and is not included in the mass ordinate. If common or borrow is designated to be used as backfill, this quantity is used in the mass ordinate.
10. **Expanded EBS Backfill** – Include this column only if there is EBS specified in the contract. This column identifies the volume of material required to backfill the EBS. This volume is computed by multiplying the volume of EBS times the EBS expansion factor. If the contract specifies granular backfill or select borrow for backfill of EBS, this represents the required quantities of the granular backfill or select borrow required to backfill the EBS, and is not included in the mass ordinate. If common excavation or borrow is specified to be used to backfill the EBS, this quantity is used in the mass ordinate.
11. **Expanded Rock** – Include this column only if there is rock specified in the contract. The expanded rock is the volume that the rock excavation will occupy in the fill. This volume is computed by multiplying the volume of rock excavation times the rock expansion factor.
12. **Unexpanded Fill** – This is the volume of fill identified in the earthwork data sheets for the segment being analyzed.
13. **Expanded Fill** – This is a visualization of the fill expanding to account for the percent increase in the volume of cut and / or borrow excavation, as measured in its original location that is needed in the fill. This is computed by multiplying the unexpanded fill (minus all rock,EBS, and/or marsh designated as fill) times the fill expansion factor.
14. **Mass Ordinate** – Indicates the volume of excess or deficient excavation required for the segment being analyzed. The mass ordinate is computed by deducting the expanded file from the "Available Material" or "Cut" if the "Available Material" column is not used. A plus value indicates the volume of waste, a minus value indicates the volume of borrow that is needed to complete the line segment being analyzed.
15. **Comments** – This column is used for any comments that are needed to clarify the information on the data sheet.

It is recommended that the earthwork be designed and computed using the CAICE or Civil 3D “Earthwork

Process" and that the earthwork summary table, in the miscellaneous quantities section of the plan, be created using the excel spreadsheet.(FDM 11-5-10, xls1). If this process is not used, the computations and the earthwork summary table must be similar and identify the same information.

The quantities on the earthwork summary table, in the miscellaneous quantities section of the plan, should be compared to the quantities on the earthwork data sheets. The earthwork summary table shall also include any comments or notations needed to supplement or clarify the information contained in the table. All discrepancies between the earthwork summary table and the earthwork data sheets should be explained in these notes.

An example of the earthwork summary table is illustrated in FDM 15-1 Figure 5.20.

Miscellaneous areas of asphaltic pavement such as driveway aprons, side roads, etc. should be included on the miscellaneous quantities sheet under the appropriate bid item. Example: 10 P.E.'s @ 5 ton = 50 tons. Whenever a plan includes the installation of culvert pipe, it shall be listed on the Miscellaneous Quantities Sheet. The pipes shall be listed under separate headings entitled Cross Drains and Minor Side Road, Private Entrance, and Slope Drains. FDM 15-1 Figure 5.20 depicts the use of these titles as well as the breakdown and type of information required to complete each listing. The pipe culvert list should include, as a minimum, the pipe location, quantity and materials information necessary for ordering the drainage items. The required thicknesses of metal culvert pipe and the class of concrete culvert pipe should be clearly shown. If corrugated metal pipe with 3-inch x 1-inch corrugations is required, or if there are culvert pipes requiring Class B bedding, this should also be indicated. When Structural Plate Pipes or Structural Plate Pipe Arches are used, the end treatment information on the culvert list should be supplemented with a drawing on the detail sheet as per FDM 15-1-20.

BASE AGGREGATE DENSE 1 ¼ - INCH
Item 305.0120

CATEGORY	LOCATION	TON
0010	200+25 – 230+31	10 398
0010	30+90'G' – 39+40'G'	3294
Sub-total (0010)		13 692
0020	15+18'Y' – 16+05'Y'	543
0020	14+12'H' – 16+10'H'	2003
Sub-total (0020)		2546
Project total		16 238

Figure 30.1 Sample Miscellaneous Quantities by Category

FDM 15-1-35 Plan and Profile Sheet

December 3, 2008

A plan and profile sheet is required on most contract plans. An example is illustrated in FDM 15-1 Attachment 5.21 and FDM 15-1 Attachment 6.3. The CADDS and CAiCE programs produce sheets with different borders and title blocks than are shown in the above examples but they are acceptable.

Each Plan and Profile Sheet shall have a title block that shall include the State Project Number(s) and space for a sheet number. This title block is along the bottom edge of the sheet.

35.1 Scales

The scale to be used for plan and profile sheets should be adequate to show the necessary details. This is governed by the topography to be shown and the complexity of the work. Plans should be drawn to a horizontal scale of one inch equals 100 feet, 50 feet or 20 feet. A scale of one inch equals 20 feet is normally used for an urban project.

Profiles shall be drawn to the same horizontal scale as the plan, but the vertical scale is usually ten times that of the horizontal scale.

35.2 Plan Requirements

The plan shall show the centerline or other reference line of the proposed roadways, side roads, interchange ramps, frontage roads, rest areas, etc. When the centerline of the proposed roadway is not coincident with the survey base line, their relationship should be indicated unless the relationship is indicated elsewhere. Where independent centerlines or reference lines are used, only the general relationship between the two should be indicated.

Stationing - Stationing of all roadways shall increase from south to north or west to east based on the cardinal

direction of the highway route.

When multiple alignments are required (ramps, alternate alignments, etc.) an identifier is often used to label each alignment. These alignment identifiers shall consist of 1 or 2 upper case alpha characters – no numeric characters. The format shall show the alignment identifier following the numeric stationing, e.g. 123+45 XX where XX is the alignment identifier.

Bearings - The bearing of all centerlines or reference lines shall be shown.

Equations of Stationing - Equations of Stationing should be shown and accentuated. See FDM 15-5 Attachment 30.3, for one method of accenting.

Begin Project and End Project Locations - Begin Project and End Project Locations should be noted and described by stationing or log distance where appropriate. The State Project Number should also be given if two or more projects are in a contract plan.

Begin Construction and End Construction Limits - Begin Construction and End Construction Limits should be indicated if different than Begin and/or End Project Locations. The construction limits for side roads should also be shown.

Coordinates - Coordinates referenced to the Wisconsin Coordinate System or the appropriate county coordinate system shall be shown for the beginning of all projects. If the centerline was tied to the Wisconsin Coordinate System by a field survey traverse, the coordinates for points of intersection (PI's) and the end of the project shall also be shown.

Curve Design Data - Curve Design Data are required unless indicated elsewhere. Curve data should include the following:

PI station
< (Deflection Angle)
Delta
T (Tangent)
L (Length)
R (Radius)
SE (Superelevation)
RO (Runoff)
SE Transition

PI grid coordinates (Y, X,) in the Wisconsin County Coordinate System or an approved alternate coordinate system (see FDM 9-5-10) should be included except on resurfacing projects.

Right-of-Way - Right-of-Way shall be shown. Dimensioning is required only if the right-of-way plat has not been included as part of the plan. The boundaries and dimensions of all construction permits shall be shown. Also show property lines and the names of property owners.

If the plan sheet is also being used as a right of way plat, see FDM 12-15-5 for additional plan sheet requirements.

Slope Intercepts - shall be shown.

Topography - Topography and other features influencing the proposed construction shall be illustrated. Included are such items as streams, marshes, woods, fences, railroads, utilities (see FDM 18-10-25), drainage facilities, driveways, roads, streets, airports, buildings on or near the right-of-way and other pertinent features.

Show the names of streets, highways, railroads, airports, cities, villages, etc. Some plans show multiple utility lines of the same type (telephone, gas, electricity, etc.) but owned by different entities. In this case show the name of the owning entity near their line.

North Arrow - shall be shown.

Bench Marks - Bench Marks should be indicated when appropriate. Specialty projects such as planting and signing generally do not require benchmarks. Benchmarks should be described by location, station-offset, description, and elevation.

Special Areas - Special Areas such as interchanges, rest areas, and wide medians should be shown, including separate survey control lines as necessary. Details for these areas shall be shown on separate layout detail sheets.

Combustible Fluids - In order to more readily identify pipelines carrying combustible fluids, the use of the "CAUTION" symbol shown in FDM 15-5 Attachment 30.2, is required on all contract plans. Within the highway right-of-way all pipelines carrying natural, manufactured, or liquefied petroleum gases, or any other combustible

or explosive fluids shall be so identified. This includes identifying the location of all flush or below ground appurtenances such as valve and regulator pits. Additional notes may be added such as depth, pressure, location, pipe size, pipe type, etc.

Removing Culvert Notations - notations are required and shall include the station, size, type and disposition of the culvert. An example is given below.

```
Station 132 + 11
Remove 1-24" CMCP
```

Public Survey Landmark locations - locations within the right of way shall be shown.

Environmentally Sensitive Areas - and areas that are not to be disturbed shall be shown.

Intersections and Curb Ramps - The type of intersections and curb ramps as shown in the standard detail drawings shall be shown unless covered by a general note.

35.3 Profile Requirements

Profiles of both the proposed grade line and existing surface grade shall be shown. These may be supplemented with profiles of existing rock, marsh, existing roadway surfaces, special ditches, side roads, etc., as appropriate. On complex projects some profiles may be shown on separate sheets. The proposed grade line shall be drafted as the dominant line, with the percentage of gradient and vertical curve information shown. Stationing and elevations should be indicated on the profile grid. All profile stationing shall be shown increasing from left to right on the sheet.

Original Surface Elevations are optional.

Proposed Grade Elevations shall be shown at all 100-foot stations.

Profile Notation should indicate if the proposed grade line represents the surface or subgrade unless it is indicated on the typical section.

Structures The clearance and cross section of the intersecting roadway, railroad, or streambed at each existing and proposed structure should be illustrated.

A structure notation including the location, structure number, structure type, span lengths, clear roadway width and skew angle shall be shown on the profile. An example is given below.

Structure notations shall also be included for sign bridges, retaining walls and high mast lighting foundations.

```
Station 109 + 50
        Structure B-60-47 Required
        2 Span 48" Continuous Welded Plate Girder 40' Clear Roadway
        Skew 3° RHF
```

A notation is also required for old structures that are being removed. This notation should include the location, structure number, span length, width and type of structure. It may be shown on either the profile or plan portion of the sheet. An example is given below.

```
Station 10 + 00
        Remove Structure P-12-79
        Single Span Steel Pony Truss
        40' Overall Length
        14' Overall Width
```

Culverts A culvert notation for cross drains including the location, number, size and skew angle shall be shown on the profile. An example is given below.

```
Station 240 + 50
        1-36" CPRC Required
        Skew 20° RHF
```

The graphic location of the culvert shall be drawn on both the plan and profile portions of the sheet.

Balance Points Show the location of all earthwork balance points, together with associated earthwork volumes,

shrinkage and swell[1]. If earthwork is to be performed by stages the balances for each stage shall be shown. The earthwork volumes shall be absolute volumes before the shrinkage or swell has been applied.

Separating Plans and Profiles In some cases it may be desirable to place plan data and profile data on separate sheets. Examples are interchanges and complex urban projects. Occasionally profiles are not required. Examples are resurfacing, signing, and planting projects.

FDM 15-1-40 Earthwork Data Sheet

September 19, 2014

The earthwork data sheets, immediately preceding the cross sections in the plan, should be used to identify the following applicable information for each station or incremental station identified in the cross sections:

1. Incremental end areas, incremental volumes, cumulative volumes, expanded volumes and expansion factors for; cut, fill, marsh excavation, rock excavation, and EBS. If marsh and/or EBS are designated to be used in the fill outside of the 1:1 slope, the fill reduction factors and the resulting marsh and/or EBS fill should be identified.
2. Cumulative mass ordinate.

Materials or conditions that may affect the end areas include salvaged pavement, pavement removal, select materials in the upper portions of the subgrade, marsh or EBS placed in the embankment, staged construction, suitability of some common excavation in early or late season construction, suitability of rock excavation or pavement removal items in shallow fills, as well as storm sewer excavation and miscellaneous structure excavation that will be incorporated into the fill. If these materials or conditions are not accounted for in the cross sections, volume corrections must be made in the earthwork summary sheet. The suitability of the material used should be discussed with the regional soils engineer.

If the project involves staged construction or multiple earthwork divisions, the earthwork for each stage or earthwork division should be analyzed separately. Each stage or earthwork division should have a separate earthwork data table.

It is recommended that the earthwork be designed and computed using the CAiCE or Civil 3D “Earthwork Process” and that the earthwork data tables be created using the excel spreadsheet (FDM 11-5-10, xls1). If this process is not used, the computations and the earthwork data tables must be similar and identify the same information. Note, if subgrade improvement is being used the designer should calculate earthwork quantities using the bottom of the subgrade improvement as the top of the earth subgrade.

An example of earthwork data table is illustrated in FDM 15-1 Attachment 5.23. The following is further clarification of each of the columns in the earthwork data table:

1. Station – Include all stations and incremental stations that are included in the cross sections.
2. Area (SF) – Include the end areas for all cut, fill, marsh, rock and EBS that is included in the cross sections. Include in the table, only the columns that apply to the project being considered. If the end areas for the “salvaged pavement/unusable material” are shown on the cross sections, these end areas should also be shown. An optional method of computing the “salvaged pavement/unusable material” is to do a length multiplied by width multiplied by depth volume calculation for the “incremental volume” column.
3. Incremental Volume – This is a computation of the volume for each end area column included in item 2 above. These are unadjusted values and do not include any expansion or shrinkage factors.
4. Cumulative Volumes – These are the cumulative volumes, with all volume correction factors applied for all of the columns identified in the “incremental volume”. In addition, any marsh or EBS that is designated to be used in the fill outside of the 1:1 slope will be identified with the shrinkage factor applied. Marsh and EBS backfill will also be identified with the expansion factor applied.
5. Mass Ordinate – The mass ordinate indicates the cumulative volume of excess material (+ value indicates waste) or deficient material (- values indicate borrow) required to complete the fill.

FDM 15-1-45 Cross Section Sheets

August 25, 2010

Cross section sheets are required in contract plans that have the following bid items:

- Common Excavation

[1] Unless a computer earthwork data sheet is provided or sufficient data is given in the earthwork summary in the miscellaneous quantities to cover balance points.

- Marsh Excavation
- Borrow Excavation
- Rock Excavation
- Fill being measured in place

The normal cross section interval is the station (100 ft). A 50-ft interval is often used on urban projects. Additional cross sections should be provided at special locations like driveways or culverts.

Each sheet shall provide a direct reading grid pattern background, either by the use of a weighted dot pattern or a weighted/screened line pattern. An example of the pattern is shown in FDM 15-1 Attachment 5.24.

Each cross section sheet shall have a title block along the bottom edge of the sheet. The title block shall include the state project number and space for a sheet number.

45.1 Scale

Horizontal and vertical graphic scales shall be shown on each cross section sheet in the lower right corner. The scales most commonly used are shown below. These scales are for 22” x 34” sheets, double the scale for 11” x 17” sheets. Example: 1”=10’ Horz and 5’ Vert on 22” x 34” sheets is 1”=20’ Horz and 10’ Vert on 11” x 17” sheets.

Table 45.1 Cross Section Sheet Scale Combinations

Scales →	1"=10' Horz	1"=10' Horz	1"=5' Horz	1"=5' Horz
Project Type ↓	1"-10' Vert	1"=5' Vert	1"=5' Vert	1"=2' Vert
Rural	X	X	X	X
Urban	X	X	X	X
Roadside Development	NOT ACCEPTABLE	X	X	X

For consultant designed projects the choice of a scale should be determined during project scoping.

45.2 Earthwork Block

The earthwork block shall contain stationing, absolute volumes for excavation by type, absolute fill volumes and sheet totals or other appropriate totals and subtotals. The excavation shall be tabulated by the bid items used in the contract. If an Earthwork Summary Sheet(s) is shown in the contract plan, the earthwork block may be omitted.

The earthwork volumes shall be absolute volumes before the shrinkage or swell has been applied.

45.3 Cross Section

Each cross section shall show the original ground line with a lightweight dashed line and the proposed cross section with a heavy weight solid line. The cross sections shall be drawn to show the finished slopes, including any topsoil or salvaged topsoil that will be placed on them. Do not show topsoil or salvaged topsoil as separate items in the cross sections and do not adjust cross sections to remove topsoil or salvaged topsoil from the final slopes or earthwork quantities. The location of marsh, rock, or special drainage sections should be indicated when relevant. Each cross section shall show station location, grade line elevation, proposed centerline, the right of way limits on both sides, and datum elevation. Additional grades, cross slopes, or transition diagrams may be shown for superelevated sections.

The cross sections can begin at the bottom of the sheet and progress to the top in ascending order of stationing. It is preferred that cross sections begin at the top of the sheet and progress to the bottom in ascending order of stationing. This allows cross sections to be viewed in ascending order across sheets in electronic format. There shall be a minimum of 1-inch clearance between cross sections.

Cross sections for divided highways shall be shown on one sheet. If the sheet lacks sufficient width to show the entire cross section at an acceptable scale, the cross section shall be split and offset.

All lines and data shall be drawn on the front of the sheet and shall be inside the printing borders as defined in

FDM 15-5-5.

45.4 Begin and End Notations

A notation indicating the beginning and ending of common, marsh and rock excavation, as well as the beginning and end of construction, shall be included, when appropriate.

45.5 Culvert Pipe and Cattle Pass Notation

Pipe culverts and cattle passes may be illustrated on the cross sections. If notations are included they should be minimal. They should show the number, size, location and skew angle if applicable. An example is given below.